Biological Evaluation of Spruce Beetle and Mountain Pine Beetle for the Hahns Peak/Bears Ears and Parks Ranger Districts, Medicine Bow – Routt National Forests, 2003

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Biological Evaluation

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SUMMARY

Pest management treatments and monitoring actions for the spruce beetle (*Dendroctonus rufipennis*) and mountain pine beetle (MPB) (*D. ponderosae*) were implemented in 2002 on the Hahns Peak/Bears Ears and Parks Ranger Districts of the Medicine Bow-Routt National Forests.

Spruce beetle and MPB-caused tree mortality increased on the Routt National Forest from 2001 to 2002. Aerial surveys indicated an increase of spruce beetle-caused mortality to 210,000 trees and 50,000 acres in 2002, approximately 18 times the number of infested trees and 12 times the infested acreage from 2001. Lodgepole pine mortality caused by MPB also increased significantly from 780 trees in 2001 to 5,600 trees in 2002. These numbers underestimate the current number of beetle-infested trees, because beetle-infested trees may take more than 1 year before foliar discoloration is evident by aerial surveys.

Pheromone traps, trap trees, infested-tree survey, and suppression actions were used on the Steamboat Ski Area to reduce bark beetle impacts in 2002. Spruce beetle-infested trees decreased from over 650 trees in 2001 to 217 in 2002. MPB-infested trees increased from 54 in 2001 to 234 in 2002 on the Steamboat Ski Area. The 2001 MPB-infested trees were not treated before the 2002 flight. A preventative insecticide treatment using carbaryl was applied to 232 healthy trees during the fall of 2002.

Bark beetle-infested trees decreased to fewer than 10 trees in the campgrounds surveyed. All these trees were felled and debarked during the fall of 2002. Granite Campground and Summit Lake Campground and Picnic Area were treated with an anti-aggregant pheromone, methylcyclohexenone (MCH) to reduce spruce beetle attacks. No newly infested spruce trees were found in the MCH or preventative insecticide treated areas for 2002. Trees in the Seedhouse Campground were treated with carbaryl before the 2002 beetle flight. Trees in nine campgrounds were treated with a preventative insecticide during the fall of 2002.

Forest Health Management (FHM) recommends that the District continue monitoring and treating of bark beetle populations to reduce beetle impacts in 2003. Aerial surveys and pheromone traps should be continued to document tree mortality and spruce beetle flight activity, respectively. Survey and suppression of bark beetle populations on the Steamboat Ski Area and campgrounds should continue. Preventative insecticide treatments should also continue for high-value trees.

FHM recommends several modifications to the bark beetle management plan for the Districts in 2003. These modifications include the application of MCH along the Priest Creek liftline and the elimination of pheromone trap clusters on the western slope of the ski area. The Districts should continue to apply MCH in the Granite and Summit Lake Campgrounds. The District should increase efforts to sanitize and salvage beetle-infested trees in 2003.

INTRODUCTION

Two bark beetles have building populations that could produce forest vegetation changes at landscape levels on the Routt National Forest. Spruce beetle (*Dendroctonus rufipennis*) populations are killing trees from the Wyoming border to Rabbit Ears pass on the Gore Mountain Range as an aftermath of the 1997 Routt Divide Blowdown. Mountain pine beetle (MPB) (*D. ponderosae*) activity has increased on the Routt National Forest and has the potential to increase to epidemic levels.

The spruce beetle is a native insect that infests spruce across North America and is the primary causal agent of recycling older spruce forests to younger spruce forests (Holsten et al. 1999). At endemic population levels, the spruce beetle persists in windthrown or diseased weakened spruce trees (Schmid and Frye 1977). Natural enemies, weather, competition, and host tree resistance are important regulating factors when spruce beetle populations are at low density. A disturbance event in the spruce forest type, such as the 1997 Routt Divide Blowdown, often creates conditions where spruce beetle populations can build to epidemic levels. At high densities, spruce beetles outstrip the ability of the natural enemies to regulate them. Outbreak populations can coalesce over the landscape creating an epidemic. Epidemics can last for many years and kill trees over vast acreages of the spruce covertype modifying stand structure (Holsten et al. 1999). Primary factors leading to the collapse of epidemic populations include the depletion of susceptible host trees and extreme cold temperatures.

Mountain pine beetle is a native insect that is the most important biotic agent of change to western pine forests (Amman et al. 1989). MPB feeds on the phloem of several pine species, including limber, lodgepole, and ponderosa pines. MPB populations persist at low densities by infesting trees weakened by lighting or disease (Schmid and Mata 1996). Factors leading to outbreaks are not well understood. MPB outbreaks are mostly related to trees stressed from damage, overcrowding, and/or age combined with climate conditions favorable for beetle development. Unlike the spruce beetle, MPB outbreaks are not triggered by a disturbance, such as windthrown trees. Outbreaks tend to occur every 15 to 20 years in older Rocky Mountain pine forests and may last six to ten years in lodgepole pine (Cole and Amman 1980). Fire often facilitates the renewal and regeneration of pine forests following major MPB outbreaks. During outbreaks, widespread tree mortality alters the forest ecosystem modifying stand structure (Amman et al. 1989). Factors leading to the collapse of MPB outbreaks are related to the depletion of trees greater than 8 inches diameter at breast height (DBH), unfavorable weather, natural enemies, and other influences.

Tree mortality associated with these bark beetles may either interfere or comply with land management objectives. If populations are not managed, then land managers are forced to accept the changes these insects have on the forest. Some negative changes associated with unmanaged bark beetle populations may be a reduction in habitat suitability for certain wildlife species and/or a reduction of timber values. Positive consequences may include the enhancement of habitat suitability for certain wildlife species or a temporary increase in water yields (Amman et al. 1989).

PURPOSE

This Biological Evaluation is a follow up to Biological Evaluations by Schaupp et al. (1999), Schaupp and Frank (2000), and Schaupp et al. (2002). The previous Biological Evaluations discussed the 1997 Routt Divide Blowdown and increasing spruce beetle and MPB populations.

This Biological Evaluation documents the monitoring and treatment of spruce beetle and MPB populations in 2002, provides an evaluation of the results of these actions, and recommends adaptive modifications of the management actions for the 2003 field season, following the direction in the Routt National Forest Bark Beetle Final Environmental Impact Statement (EIS) (USDA 2002).

METHODS

Monitoring Actions

Aerial Survey

Aerial surveys were conducted from a fixed wing, single engine aircraft at about 1,500 ft. above the ground at approximately 100 mph during August 2002. Erik Johnson and Kelly Sullivan performed the aerial surveys. Recent tree mortality and new windthrow was recorded onto 1:100,000 scale US Geological Survey 30X60 minute maps. Identifying newly infested trees from aircraft is difficult, because trees do not fade from bark beetle attack until the following year. Even then, dead spruce needles fall off the tree easily so the tree continues to look healthy until most of the needles fall off. Dead pine needles turn "red" and stay on the tree for a longer period of time making dead pine trees easier to identify than dead spruce trees during the aerial surveys. Aerial surveys provide trends and approximate location that facilitates ground surveys, but does not convey the exact numbers of infested or diseased trees.

Spruce Beetle Pheromone Monitoring Traps

Nine locations were used to monitor the spruce beetle flight across the Hahns Peak/Bears Ears Ranger District. Each location consisted of two 16-funnel Lindgren traps baited with a two-component attractant (frontalin and alpha-pinene). The traps were located in areas monitored the previous three years, except for traps on Buffalo Pass, which were moved one mile east and traps at Floyd Fork, which were moved ½ mile south from their 2001 locations. The Iron Lopez trap location of previous years was renamed Hahns Peak. Traps were installed the 2nd week of April and monitored weekly by district staff from 2nd week of June through July, and every two weeks after that period until mid-September 2002. The traps were retrieved the week of the 20th of September. The Mt. Werner monitoring trap data were combined with the ski area pheromone traps data and were used for making spruce beetle management decisions on the ski area.

Suppression and Preventative Actions

Ski Area

A comprehensive Integrated Pest Management (IPM) plan consisting of trap trees, pheromone baited funnel traps, preventative insecticide treatments, and cutting and debarking of infested trees was implemented for the Steamboat Ski Area to reduce the impacts of spruce beetle and MPB. These various methods were used to reduce beetle populations and beetle-caused tree mortality within the ski area and to prevent additional spruce beetles from immigrating to the ski area.

To reduce spruce beetle populations within the 2001 treatment area, trap trees were felled to absorb spruce beetles emerging from infested trees. Three groups of trap trees, 5 trees per [illegible] provides an evaluation of the results of the [illegible] actions, and [illegible] of the management [illegible] for the [illegible] field season [illegible] Routt National Forest Spruce Beetle Final Environmental Impact Statement [illegible]

METHODS

[illegible] conducted [illegible] approximately [illegible] the aerial surveys [illegible] was [illegible] 100 scale US Geological Survey 30' [illegible] is difficult because [illegible] dead spruce [illegible] most of the needles [illegible] dead pine [illegible] surveys. Aerial surveys provide [illegible] ways, they do not convey the exact numbers [illegible]

Pheromone-Monitoring Traps

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[illegible]

[illegible]

group, were felled the last week of April 2002 in the most heavily infested stand during 2001. A trap tree was also felled in conjunction with 13 of the pheromone trap clusters.

Pheromone trap clusters, consisting of three Lindgren funnel traps baited with a two-component spruce beetle lure (frontalin and alpha-pinene), were placed at 26 locations (Figure 5). The objectives of the pheromone trap clusters were to absorb spruce beetles, to monitor where spruce beetles may be moving onto the ski area, and to concentrate infestations on the aggressive suppression zone surrounding the ski area. Pheromone trap clusters were placed primarily around the north, east and south boundaries of the ski area, with a few locations in key drainages to the west. Topography and known spruce beetle populations near the ski area were used to determine pheromone trap cluster locations. The Mt. Werner pheromone trap locations were single traps that were continued from the monitoring program of the previous years.

Priority spruce/fir and lodgepole stands on and adjacent to the ski area were surveyed for beetle-infested trees during July, August, September and October of 2002. Other areas of spruce, such as drainages and open ski runs, were also surveyed. Much of the ski area is covered by aspen with scattered mixed conifers. Surveying consisted of "gridding" through the stands and looking for boring dust, pitchtubes, or woodpecker activity that would indicate the presence of spruce beetle or MPB. "Gridding" is crewmembers spaced every 20 to 50 feet apart and walking through the stands in a systematic "Z" pattern monitoring every spruce and lodgepole tree and identifying infested trees. Beetle presence was indicated by finding bark beetle eggs, larvae, pupae, or adults. Global Positioning System equipment was used to record the position of infested trees.

A commercial applicator was contracted to treat high-value trees with a preventative insecticide. District staff designated 232 trees to be treated. The contractor applied Sevin XLR Plus with a hydraulic 300 psi ground sprayer to the bole surface up to 50 ft above ground level and to exposed roots. District staff inspected trees for thorough coverage and spray height requirements as specified by the contract.

Campgrounds

Nineteen campgrounds and picnic areas were ground surveyed during the summer of 2002 for bark beetle infestations, using the gridding method. The campgrounds included: Sawmill Creek, Freeman, Hahns Peak Lake, Seedhouse, Seedhouse Groupsite, Hinman, Dry Lake, Summit Lake, Granite, Meadows, Walton Creek, Dumont, Hidden Lakes, Grizzly Creek, Teal Lake, and Big Creek Lakes Campgrounds. Picnic areas included Hahns Peak Lake and Ferndale.

Granite Campground and Summit Lake Campground and picnic area were treated with methylcyclohexenone (MCH), an anti-aggregant pheromone of spruce beetle (PheroTech Inc., Delta, British Columbia, Canada). MCH packets were dispensed on every spruce tree within the protected areas, plus a boundary of MCH packets were spaced approximately every 50 feet along the perimeter of the treated area. Natural openings, such as lakes and meadows were used to help determine treatment area boundaries. Granite Campground (7.0 acres) and Summit Lake Campground (5.6 acres) and picnic area (2.1 acres) were treated with 400, 300 and 200 packets of MCH, respectively. MCH treated areas were surveyed for beetle-infested trees in August and September.

Sevin XLR was applied to 976 healthy, high-value trees to prevent them from becoming infested with bark beetles. Dumont, Walton Creek, Meadows, Seedhouse Groupsite, Hinman, Hahns

[illegible] Dry Lake Campground were treated in September, and [illegible]

[illegible] 1,400 yards southeast of the Granite Campground [illegible] Ten traps [illegible] 100 yards southeast of Walton Creek Campground. Six traps [illegible] were [illegible] Meadows Campground. These traps were [illegible] the last week [illegible] trees were [illegible] beetle infestation in August and September and [illegible] of [illegible]

Corridors

[illegible] mile on Rabbit Ears Pass along Highway 40 and [illegible] Buffalo Pass along Forest Road [illegible] as described in Schaupp et al. (2002) [illegible] were surveyed along Rabbit Ears Pass [illegible] the east to Dumont Lake Campground in October. Spruce-fir stands [illegible] 10,000 [illegible] of Buffalo [illegible] road for approximately two miles were surveyed [illegible] Snow cover prevented surveys at higher elevations on Buffalo Pass.

[illegible] marked for thinning (partial cutting) to reduce [illegible] of the marked area, approximately 700 acres of lodgepole [illegible] the Coulton Creek area, northwest of Clark, CO. The [illegible] in designated lodgepole pine and spruce-fir stands [illegible]

RESULTS

[illegible] increase in MPB and spruce beetle [illegible] spruce beetle-caused mortality [illegible] approximately 18 times the number of [illegible] 13 times the [illegible] (Table 1) [illegible] spruce beetle infestations [illegible] in 200[illegible] (Figure 1). These numbers [illegible] attacked trees, because spruce beetle-infested trees [illegible] discoloration is evident to annual surveys. Lodgepole pine mortality [illegible] in 2001 to 5,8[illegible] trees [illegible]

Peak Lake, Sawmill, Summit Lake and Dry Lake Campgrounds were treated in September and October, 2002.

Ten trap trees were felled 100 yards southeast of the Granite Campground entrance. Ten trap trees were felled 100 yards southeast of Walton Creek Campground. Six trap trees were felled 100 yards southwest of Meadows campground. These trap trees were felled the last week of April. The trap trees were inspected for spruce beetle infestation in August and September and debarked in September and October 2002.

Scenic Corridors

Stands within ¼ mile on Rabbit Ears Pass along Highway 40 and on Buffalo Pass along Forest Service Road 60 were surveyed. The survey methods as described in Schaupp et al. (2002). Spruce/fir and lodgepole pine stands were surveyed along Rabbit Ears Pass from Ferndale Picnic Area east to Dumont Lake Campground in October. Spruce/fir stands below 10,000 ft within ¼ mile of Buffalo Pass road for approximately two miles were surveyed west of the continental divide. Snow cover prevented surveying at higher elevations on Buffalo Pass in 2002.

Silvicultural Treatments

Over 1,000 acres were marked for thinning (partial cutting) to reduce or prevent bark beetle impacts. Most of the marked area, approximately 700 acres of lodgepole and 300 acres of spruce, was in the Coulton Creek area northeast of Clark, CO. The partial cutting prescription is to reduce the basal area in designated lodgepole pine and spruce/fir stands.

RESULTS

2002 Accomplishments

Monitoring

Aerial Survey

Aerial survey detected a continued increase in MPB and spruce beetle-caused mortality within the EIS analysis area. Observable spruce beetle-caused mortality increased to 210,000 trees and 50,000 acres in 2002, approximately 18 times the number of infested trees and 12 times the infested acreage from 2001 (Table 1). The spruce beetle infestation was also more evident further south in 2002 compared to 2001 (Figure 1). These numbers underestimate the current number of spruce beetle-infested trees, because spruce beetle-infested trees may take more than one year before foliar discoloration is evident by aerial surveys. Lodgepole pine mortality from MPB also increased from 780 trees in 2001 to 5,600 trees in 2002 for the EIS assessment area (Table 1).

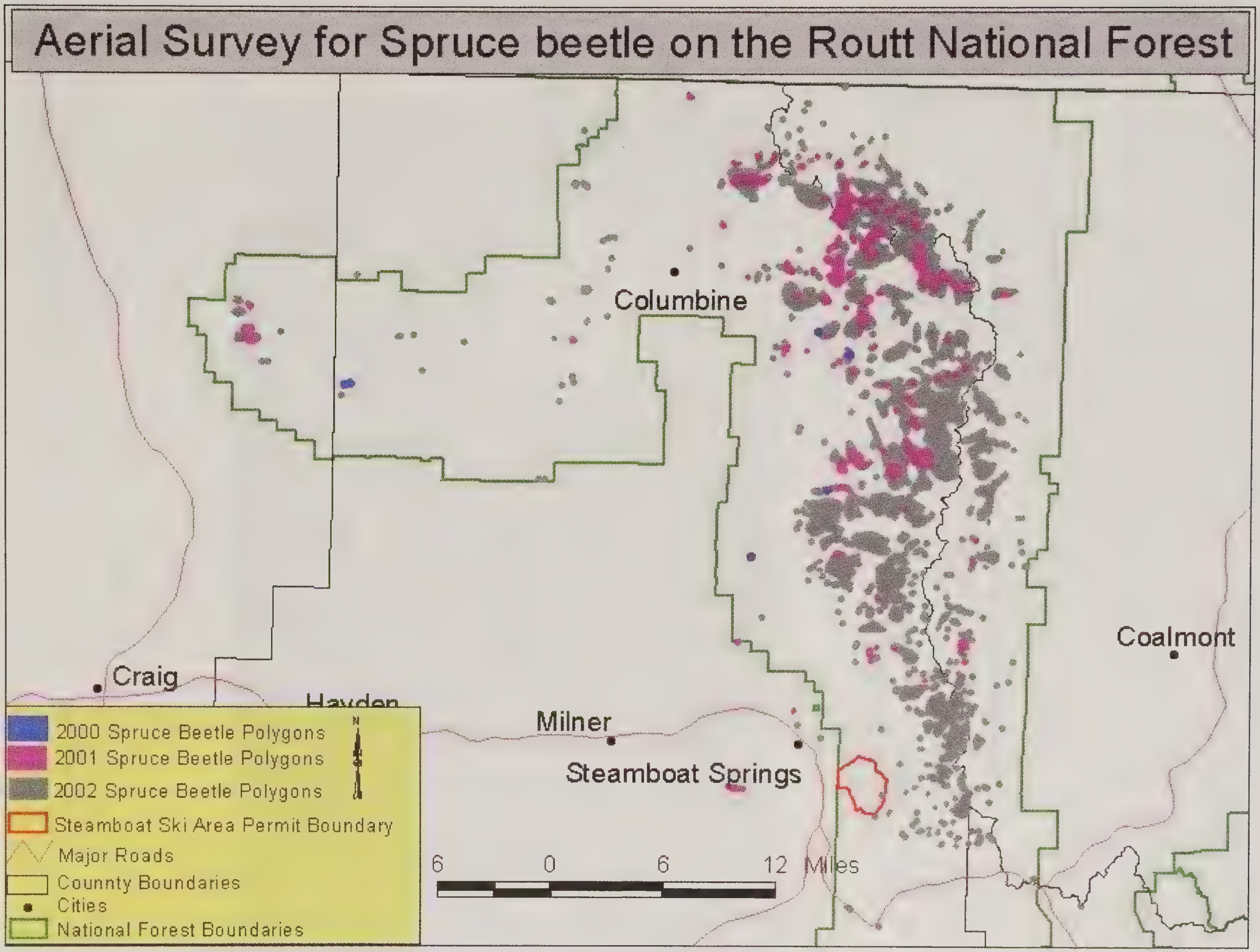

Figure 1. Spruce beetle epidemic on the Routt National Forest from the 2000 to 2002 aerial surveys.

Table 1. Aerial survey estimates of spruce beetle and mountain pine beetle-caused mortality in the analysis area for the Routt National Forest Bark Beetle Environmental Impact Statement, 2000-2002.

	2000		2001		2002	
	Trees	Acres	Trees	Acres	Trees	Acres
Spruce Beetle	24	22	12,000	4,000	210,000	50,000
Mountain Pine Beetle	370	340	780	560	5,600	4,000

Spruce Beetle Pheromone Traps

The pheromone trap catch patterns in 2002 were similar to previous years. Most of the beetles were caught at the Hahns Peak and Bears Ears trap locations and capture periods were synchronized at these sites (Figure 2). Spruce beetles were active throughout June and July during 2002 (Figure 2). The beetle catches for 2002 were similar to 2000 and 2001 with most captures in June and July and fewer beetles caught during August (Figure 3).

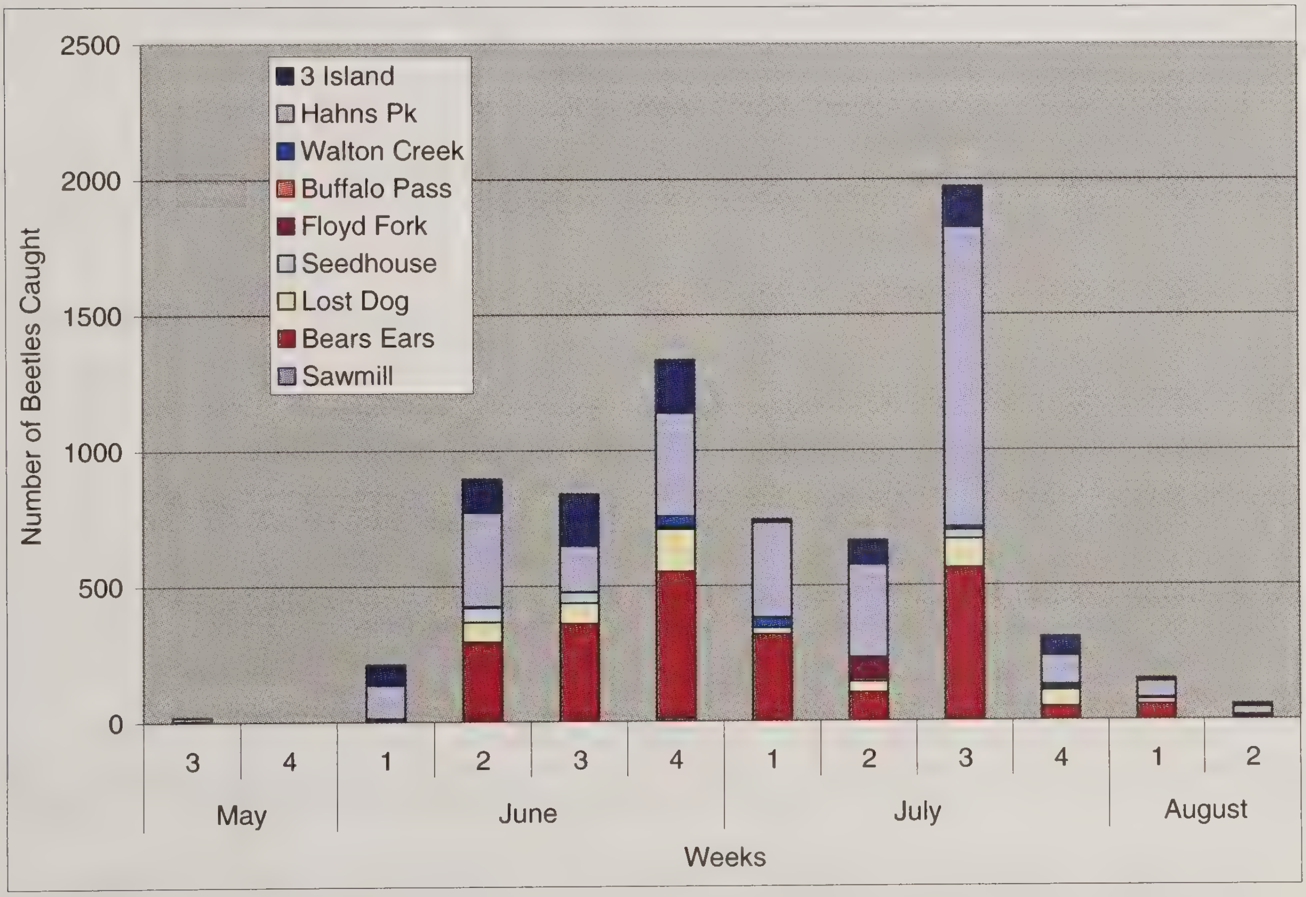

Figure 2. Spruce beetle counts of forest wide monitoring pheromone traps for the Hahns Peak/Bears Ears Ranger District by location, 2002.

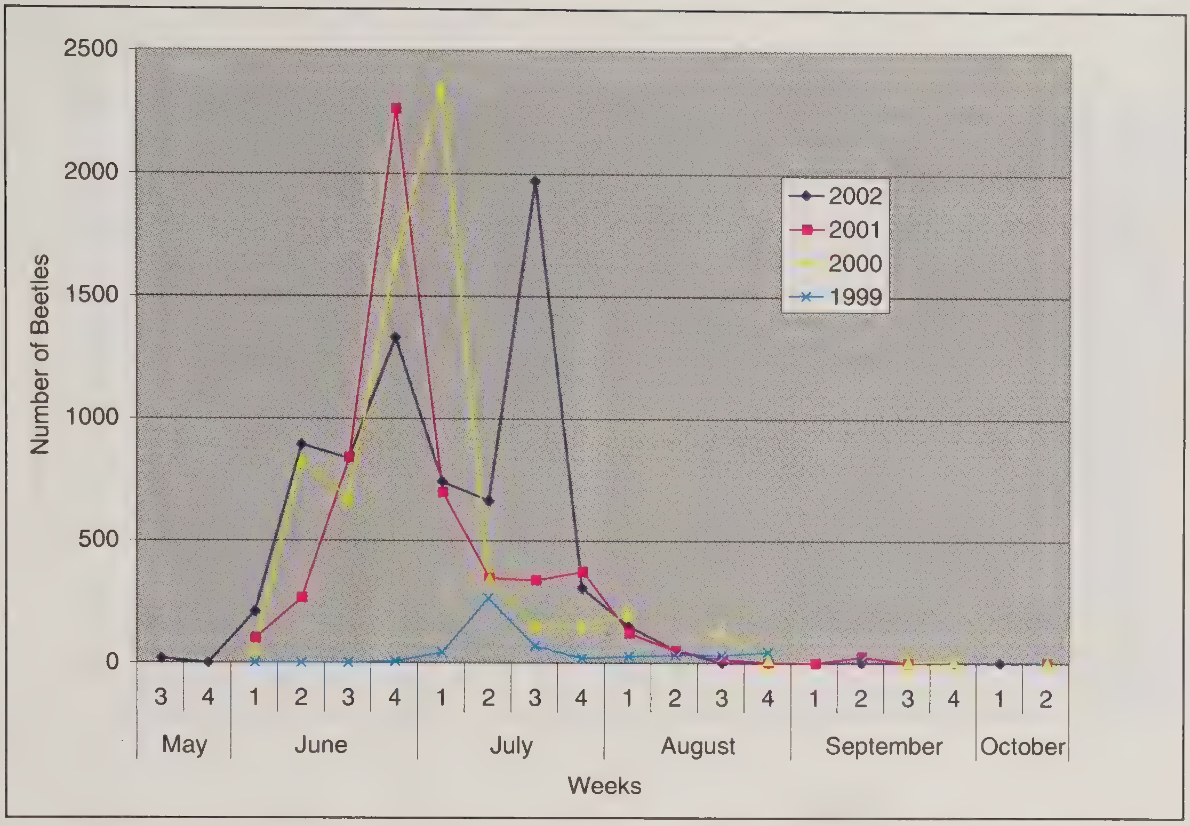

Figure 3. Weekly spruce beetle pheromone trap catch totals for the Hahns Peak/Bears Ears Ranger District, 1999 - 2002.

Suppression and Prevention

Ski Area

In 2002, crews identified 217 spruce beetle-infested Englemann spruce trees and 234 MPB-infested lodgepole pine trees on the Steamboat Ski Area. All identified infested spruce trees and trap trees on the ski area were cut and debarked to destroy the developing beetle broods during September and October. Approximately 100 of the 234 infested lodgepole pine trees were cut and debarked before snow prevented access for treatment. The remaining 134 MPB-infested lodgepole pine were not treated in the fall of 2002 and should be felled and debarked before the expected MPB flight in July 2003.

The pattern of spruce beetle pheromone trap catches on the ski area was similar to pattern of the pheromone trap catches on other parts of the District. Spruce beetle trap catches peaked at the end of June with another pronounced peak at the end of July (Figure 4).

The presence of a downed spruce tree associated with a pheromone trap cluster appeared to have influenced the number of beetles caught in that particular pheromone trap cluster. On average, pheromone trap clusters associated with a downed spruce tree caught more spruce beetles than pheromone trap clusters without a trap tree (Table 2 and Figure 5).

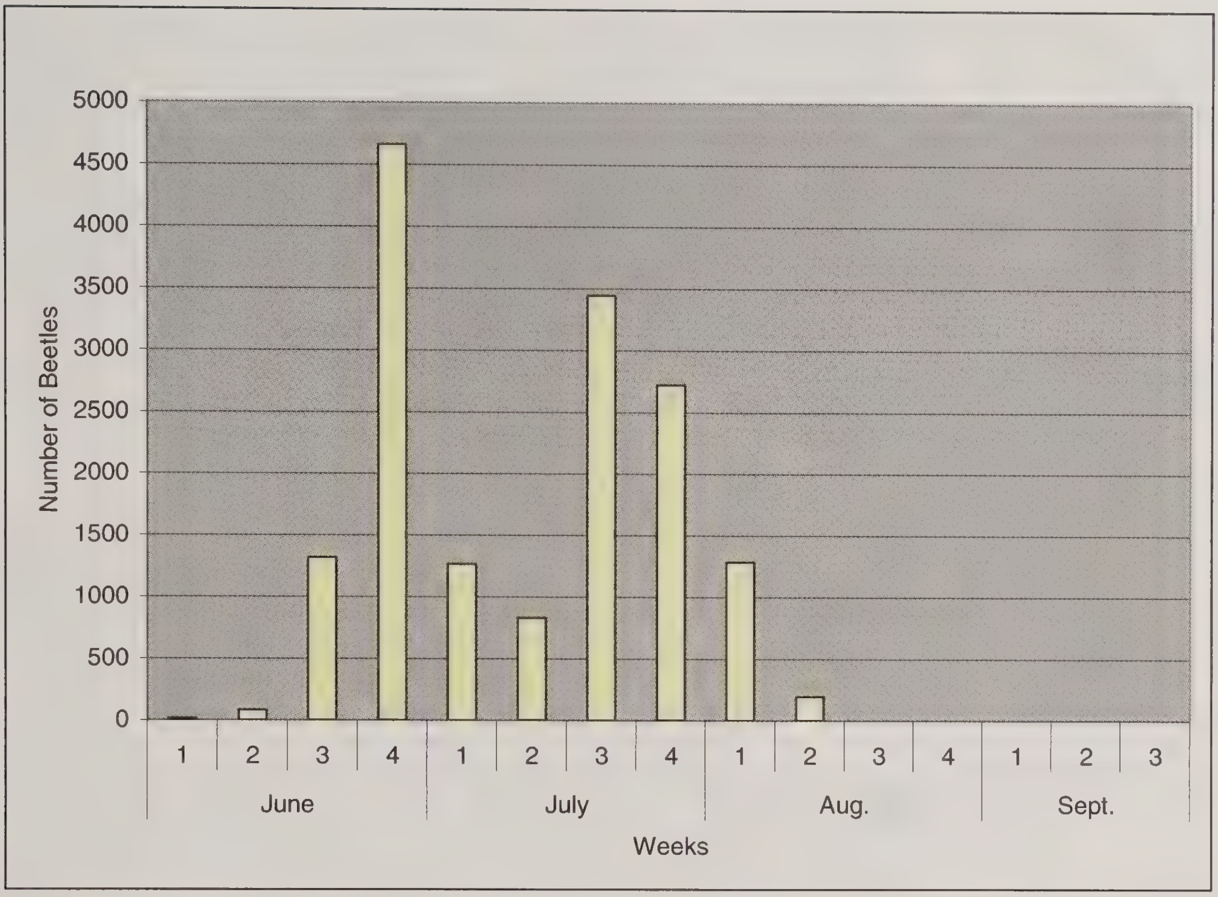

Figure 4. Total number of spruce beetles from 78 pheromone traps on the Steamboat Ski Area in 2002.

Table 2. Mean (± standard error of the mean) spruce beetle catch by the presence or absence of a trap tree associated with a pheromone trap cluster on the Steamboat Ski Area 2002.

Trap Tree	Number of Trap Clusters*	Mean (± SEM)
Present	13	918 ± 247
Absent	13	291± 111

* Three pheromone traps per trap cluster.

Preventative spraying was planned for the fall of 2001 on the ski area, but was not completed because of snow. In September 2002, 232 healthy trees were treated with the insecticide Sevin XLR for protection during the 2003 beetle flight.

Infested spruce decreased on the ski area from over 650 trees in 2001 to 217 in 2002, whereas MPB-infested lodgepole increased from 54 in 2001 to 234 in 2002. The decrease in the number of spruce beetle-infested spruce trees is likely a result of the suppression actions from the previous year. Unlike the infested spruce trees that were treated, the 54 MPB-infested trees were not treated before the 2002 beetle flight. The MPB-infested lodgepole trees of 2002 were in the same vicinity as the infested trees of 2001 (Figure 6). The number of MPB-infested lodgepole pines in 2002 might have been reduced if the 2001 infested MPB trees had been removed or treated before MPB emergence in July 2002.

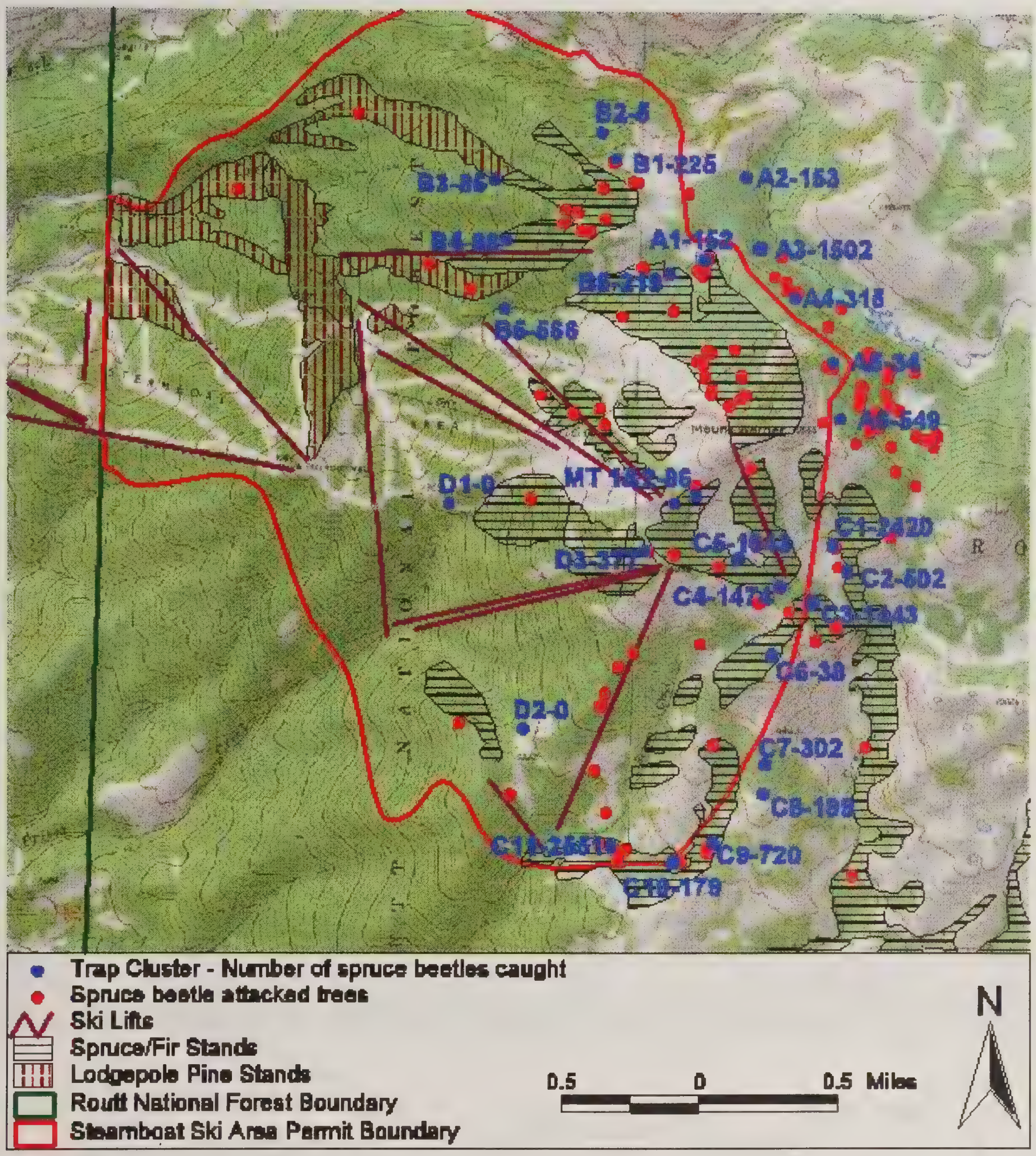

Figure 5. Locations of the spruce beetle attacked trees, pheromone trap clusters, and the number of spruce beetles that each pheromone trap cluster caught during 2002 on or near the Steamboat Ski Area. Note – Pheromone trap clusters A3, A5, A6, B1, B4, B5, B6, C1, C2, C4, C5, C10, and C11 had a trap tree associated with them.

Only spruce/fir and lodgepole pine stands that lie entirely or partially within the ski area are outlined.

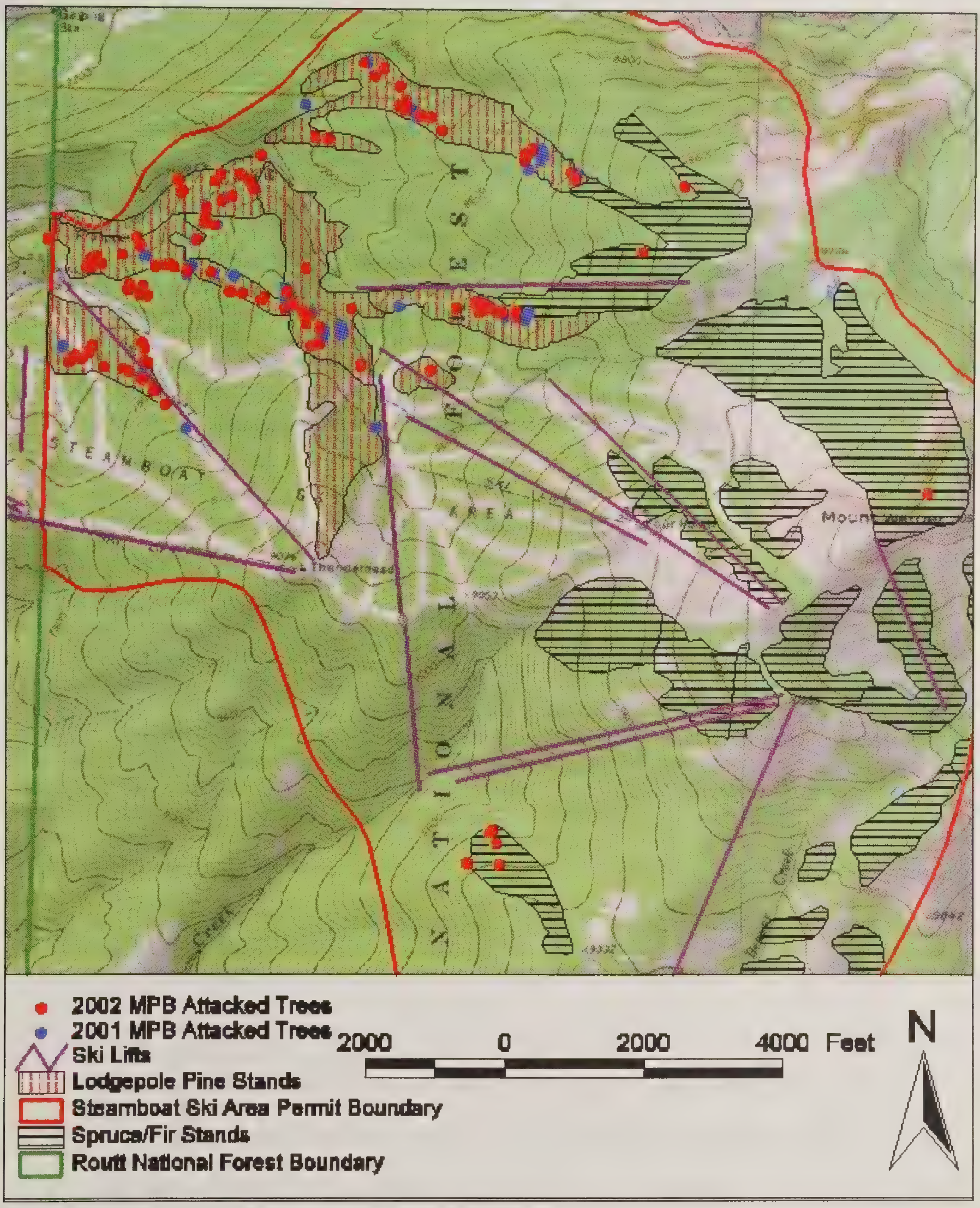

Figure 6. Locations of 2002 and 2001 mountain pine beetle attacked trees on the Steamboat Ski Area.

Campgrounds

Fewer than ten beetle-infested trees were identified and treated in the campgrounds and picnic areas in October 2002, which is a decrease from 46 trees in 2001. No newly infested spruce trees were identified in the MCH or insecticide treated areas of Summit Lake and Granite Campgrounds, and Seedhouse Campground, respectively.

Scenic Corridors

Eighty-nine MPB-infested lodgepole pine and 64 spruce beetle-infested trees were recorded by ground surveys along Rabbit Ears Pass corridor. Crews treated approximately 40 trees along the Rabbit Ears Pass corridor near the west summit trailhead.

Survey crews identified 57 spruce beetle-infested trees in the Buffalo Pass surveyed area. In 2001, the same area on Buffalo Pass had 16 spruce beetle-infested trees. None of the infested trees in the Buffalo Pass corridor were treated in 2002.

Silvicultural Treatments

The sanitation removal of 800 infested spruce trees in the Coulton Creek area (Location 231201: Stand 0058) during 2001 appeared to have reduced the number of spruce beetle-infested trees in 2002. Walk-through surveys by District staff indicated a decrease in the number of spruce beetle-infested trees from 2001. Continued monitoring of this area will be necessary to determine if the 2001 actions limited further spruce beetle impacts.

2002 Fire Impacts

The Burn Ridge, Hinman and other fires on the Routt National Forest killed many spruce beetles and destroyed thousands of acres of potential spruce beetle habitat. However, these fires have had little impact on the current spruce beetle epidemic across the EIS assessment area and have not altered the course of the epidemic.

2002 Community Involvement

- 50 news stories, 10 local government meetings, 15 public meetings discussed fires, beetles, and the blowdown.
- 16 Public Service Announcements were made in conjunction with the Bark Beetle Task Force.
- Approximately 3,000 people were informed by Yampatika (an Interpretive Association program) with bark beetle information.
- Two congressional staffers were updated on the Routt National Forest bark beetle situation.
- Forest Service personnel participated in a tour for state elected officials and specialists about fire and bark beetles.
- Approximately 8,000 people visited the KIOSK on the Steamboat Ski Area where a bark beetle display informed them of the current situation.
- Approximately 24 news releases involving beetle-killed trees and fire were distributed.
- Beetle/Fire tours were conducted for 200 students, 40 teachers, 20 college students, and 80 people from civic groups.

- Formal presentations were made to 20 local businesses and a daily flyer to 150 businesses involving fire and beetles was distributed.
- Internet Site- http://www.fs.fed.us/r2/mbr/resourcemgmt/blowdown/index.shtml

DISCUSSION

Bark Beetle Management Actions and Adaptations for 2003

Monitoring

Aerial Survey

Aerial surveys should be conducted to document the tree mortality associated with spruce beetle, MPB, and other factors across the EIS assessment area.

Spruce Beetle Pheromone Traps

The sites for monitoring spruce beetle activity across the EIS assessment area should be used again in 2003 to help determine when ground surveying should begin and to document the spruce beetle flight activity.

The large spruce beetle catch the third week of July in 2002 was unexpected, because previous year's flight data indicated a peak in late June and early July. If surveying began before the peak flight, the surveys would have given a low estimate of the number of infested trees for the current year. Beetle catches from previous years indicates that some spruce beetles continued to fly throughout the season as conditions allowed. Due to the mid- to late-July flight activity of the spruce beetle in the Steamboat area, Forest Health Management (FHM) recommends that ground surveying beetle infested trees begin in late July or early August.

Suppression and Prevention

Ski Area

Many bark beetle management tactics were used on the Steamboat Ski Area. A preventative insecticide treatment is the best tactic to protect individual trees, but environmental concerns, access, and cost prevents an insecticide treatment for all the trees on the ski area. Other management tactics that can be used on the ski area include pheromone traps, anti-aggregant pheromones, debarking or removing infested trees, and trap trees.

The pheromone trap clusters were located on the ski area and on the eastern buffer area with the purpose to trap out spruce beetles as they immigrated onto the ski area. The pheromone trap clusters appeared to concentrate the spruce beetle population on adjacent spruce trees. FHM recommends that the District eliminate the pheromone trap clusters on the western slope of the ski area thereby reducing the loss of spruce trees to beetle infestation on the ski area, proper. Pheromone trap clusters should be continued in the northern, eastern and southern buffer areas, concentrating beetle attacks outside the ski area, proper. Aggressive suppression actions could then be limited in the buffer area only. FHM recommends felling a trap tree with each pheromone trap cluster.

Trees treated with carbaryl in the fall of 2002 for bark beetle prevention should not need treatment again until 2004. However, if more trees need treatment, it should occur before the next beetle flight. Specific formulations of carbaryl have been shown to be effective for up to 18 months, so a 2003 application should be unnecessary for trees treated in 2002 (Hastings et al. 2001). Permethrin is also currently labeled for bark beetle prevention and may be a viable option, but the longevity of effectiveness is unclear.

FHM recommends that the anti-aggregant pheromone MCH should be placed along the Priest Creek Lift line, if those spruce trees are to be protected. These trees were not treated with a preventative insecticide treatment, because they were not accessible by the application equipment.

Approximately 134 MPB-infested lodgepole pines were not treated in the fall of 2002. These trees should be cut and debarked before beetle flight occurs in July 2003. If these trees are not treated, it is very likely that there will be an increase in MPB-infested trees in 2003.

Approximately 20 spruce/fir and 8 lodgepole pine priority stands in and near the ski area permit boundary should be surveyed for spruce beetle and MPB infestations after peak flights periods. These periods occur in mid-July and late-July for the spruce beetle and MPB, respectively. In addition to these stands, drainages and other areas where spruce trees are located should be surveyed. All infested trees should be treated as soon as possible in late August or September before inclement winter weather prevents work outside. Cutting and debarking is the preferred treatment for infested trees on the ski area, but cutting and removal should be considered.

The trap trees on the ski area in 2002 were approximately half full of spruce beetles. A spruce infesting *Ips* spp. covered approximately the top half of the trap trees. The use of trap trees in 2003 is only weakly recommended, because of the competition with *Ips* beetles. To make the trap tree more conducive for spruce beetles and less attractive to *Ips*, some branches from the crown may be cut and placed on the lower bole, which usually lacks branches. The branches on the lower bole will increase shade on the upper surfaces enhancing habitat for spruce beetle, and lessening the suitability of the bole for *Ips* (Schmid personal communication).

The use of lethal trap trees is recommended if used in conjunction with formal evaluation by Forest Service Research and Forest Health Management. Having the trap trees treated with an insecticide should kill any beetles that try to enter it, and reduce the competition factor from both *Ips* and other spruce beetles possibly improving the trap tree treatment. If lethal trap trees are implemented, spruce beetle bait will likely enhance the attractiveness of the lethal trap tree to the spruce beetles drawing more beetles to the lethal trap tree.

Campgrounds

All the campgrounds and buffer areas described in the EIS should be surveyed for any new beetle-infested trees. Infested trees should be treated before the winter weather prevents treatment. Trees in the Seedhouse Campground should receive an insecticide treatment during in the fall of 2003, because these trees were last treated the fall of 2001.

Granite and Summit Lake Campgrounds should be treated again with MCH to continue to protect spruce trees that did not receive the preventative insecticide treatment. MCH is being used at Granite Campground, because insecticides are not to be used near the water source for the City of Steamboat Springs as identified in the EIS. No standing spruce beetle-infested trees were found in the MCH treated areas of Granite or Summit Lake Campgrounds in 2002. The

MCH may or may not have prevented attack from the spruce beetle, but the MCH application did not increase the number of spruce beetle-infested trees. Therefore, the MCH application appeared to have caused no harm and may have protected the treated areas. There has been mixed results using MCH to minimize spruce beetle impacts in other regions of the U.S. (Zogas 2001).

Trap trees should be planned around the campgrounds where there are low populations of spruce beetle. However, where spruce beetle populations are anticipated to be very high, trap trees are not recommended. In some areas where management objectives permit, lethal trap trees may be a better option in reducing spruce beetle impacts. See the ski area discussion for possible benefits of lethal trap trees compared to non-treated trap trees.

Scenic Corridors

Surveys should continue in the Rabbit Ears and Buffalo scenic corridors in 2003. Some areas of the scenic corridors may warrant treating trees with a preventative insecticide. The District plans to treat approximately 500 high-value uninfested trees along the corridors with a preventative insecticide to reduce the visual impacts of the bark beetles. Commercial sanitation may also be a viable option to help reduce the impacts of the bark beetles in these areas. Approximately 100 MPB-infested lodgepole pines are planned for treatment before beetle emergence in the summer of 2003. These trees will likely be cut and debarked by Forest Service crews, but other removal strategies should be considered.

Silvicultural Treatment Areas

Preventative silvicultural treatments are planned for several areas in the assessment area. In 2003, marking of timber units is scheduled in four areas. In the Coulton Creek area approximately 400 acres of spruce are planned to be marked for a partial cut treatment. The Coulton Creek area contract should be out for bid and awarded sometime during the summer of 2003. Harvesting under this contract could happen before the close of the 2003 field season. In the Floyd Peak area, approximately 400 acres of spruce and 800 acres of lodgepole pine are scheduled to be marked for silvicultural treatment. The Red Creek area has approximately 300 acres of spruce and lodgepole pine stands that are expected to be marked for treatment. The partial cut prescription for all the areas is a reduction in basal area, plus the removal of beetle-infested trees while the prescription is being administered.

Where management objectives and access allows, commercial sanitation may play a more substantial role in the suppression efforts during 2003. The removal of infested trees will lower the immediate bark beetle population and may reduce the risk of more trees being infested.

Partial cutting is not scheduled to begin until late summer of 2003. Monitoring of the partial cut units will be useful in determining the success of the partial cut treatments.

Community Involvement

The Forest plans to hire an interpreter to make bark beetle presentations and provide public outreach at local events to explain the current bark beetle situation. Several news articles are planned to update the public on the bark beetle situation. The Forest should stay involved with the Routt County Bark Beetle Task Force.

Potential Research Opportunities

The following is a list of topics suitable for research in cooperation with Forest Service Research and Forest Health Management.

- Monitoring partial cut areas and subsequent spruce beetle activity could provide valuable information for future management recommendations.
- Permanent plots to test different levels of partial cutting in proposed thinning areas of lodgepole pine and spruce.
- Document the effectiveness of insecticides such as carbaryl or permethrin in creating lethal trap trees for the spruce beetle.
- Lethal trap trees could be used in conjunction with pheromone baits for the spruce beetle.
- The influence scorched and non-scorched portions of the tree regarding spruce beetle attacks and successful establishment.
- Determine the effects of the levels of scorch on spruce beetle populations in trees infested prior to being scorched.

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